

42. On the Cestode Parasites from Mammalian Hosts which died in the Gardens of the Zoological Society of London during the years 1919-1921; with a description of a new Species of *Cyclorchida*. By G. M. VEVERS, M.R.C.S., L.R.C.P., F.Z.S., Beit Memorial Research Fellow, and Assistant in the Department of Helminthology, London School of Tropical Medicine.

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(Text-figures 11-12.)

During the period under review eleven species of Cestoda were collected from thirteen mammalian hosts dying in the Gardens. One of these is new to science, and has been placed in the genus *Cyclorchida* Fuhr. This is the first record of a member of this genus occurring in a mammal, the only other species (*C. omalancistrota*) being from a bird (*Platalea leucorodea*). Two of the species are larval forms; of these it is interesting to note *Multiceps (Cenurus) serialis* from the lung of the Coypu (*Myopotamus coypus*), bred in Britain. The only other record of the occurrence of this parasite in this particular host is that made by Pagenstecher in 1877, the Coypu in this case being one which had been in captivity in the Berlin Zoological Gardens (1). Apart from this, the only other larval form noted was that of *Tenia hydatigena (Cysticercus tenuicollis)* from three Ungulates.

*Systematic List of Species.*

CYCLOPHYLLIDEA (Adult forms).

MESOCESTOIDIDÆ Fuhrmann, 1907.

MESOCESTOIDES Railliet, 1893.

*M. lineatus* (Goeze, 1782), Railliet, 1893.

ANOPLOCEPHALIDÆ Kholodk, 1902.

ANOPLOCEPHALINÆ R. Blanchard, 1911.

MONIEZIA R. Blanchard, 1911.

*M. expansa* (Rudolphi, 1810), R. Blanchard, 1891.

LINSTOWINÆ Fuhrmann, 1907.

INERMICAPSIFER Janicki, 1910.

*I. pagenstecheri* Janicki, 1910.

*I. settii* Janicki, 1910.

*I. interpositus* Janicki, 1910.

HYMENOLEPIDIDÆ R. & H., 1909.

DIPYLIDIINÆ Stiles, 1896.

CYCLORCHIDA Fuhrmann, 1907.

*C. crassivesicula*, sp. n.

TÆNIIDÆ Ludwig, 1886.

TÆNIINÆ Stiles, 1896.

ECHINOCOCCUS Rudolphi, 1801.

*E. granulatus* (Batsch, 1786), Rud., 1805.

TÆNIA Linnæus, 1758.

*T. taeniiformis* (Batsch, 1786), Wolfhügel, 1911.

*T. balaniceps* Hall, 1910.

CYCLOPHYLLIDÆA (Larval forms).

TÆNIIDÆ Ludwig, 1886.

MULTICEPS Goeze, 1782.

*M. (Cœnurus) serialis* (Gervais, 1847), Stiles & Stev., 1905.

TÆNIA Linnæus, 1788.

*T. hydatigena* Pallas, 1766.

(Syn. *Cysticercus tenuicollis* Rud., 1810.)

#### CYCLOPHYLLIDEA.

MESOCESTOIDIDÆ Fuhrmann, 1907.

*Mesocestoides lineatus* (Goeze, 1782), Railliet, 1893.

The occurrence of this species in a Fox and two Badgers, all from Britain, is interesting, as it opens up the question of the occurrence of two species, *M. lineatus* and *M. litteratus*, in this country, and also throws some light on the question of the validity of the latter species.

Hall stated in 1919 (2) that he could not express an opinion on the validity of *M. litteratus*, but that he retained the name although he could not see any evidence from material or descriptions for supposing that it was a separate species. In the examination of the material from the three hosts mentioned above, certain variations in the size and shape of the head, neck, segments, and internal anatomy were noticed, all of which might be accounted for by differences in the mode of preservation. In the case of the material from one Badger, the host had been dead some time, and the worms were also dead and well extended in consequence; in the case of the other Badger the worms were collected and killed at once, in consequence of which each strobila was much contracted, causing distortion of the internal organs of each segment.

The material from the Fox was dead when preserved, and therefore well relaxed.

I am of opinion that all three batches of material collected from these three hosts belong to the same species (*H. lineatus*), the differences between them being of a transitional or varietal nature, or due to differences in the methods of preservation.

With regard to the validity of the species *M. litteratus*; considering the extreme variability of *M. lineatus*, coupled with the fact that both have been recorded from the same hosts, there seems to be no reason for keeping *M. litteratus* as a separate species, especially as none of the descriptions given for it, including the original by Batsch (1786) (3), contain any points on which to differentiate it from *M. lineatus*.

#### ANOPLOCEPHALIDÆ Kholodk, 1902.

LINSTOWINÆ Fuhrmann, 1907.

INERMICAPSIFER Janicki, 1910.

(a) *Inermicapsifer pagenstecheri* Janicki, 1910.

(b) *Inermicapsifer settii* Janicki, 1910.

(c) *Inermicapsifer interpositus* Janicki, 1910.

In listing these three species of *Inermicapsifer* from the Rock Rabbit (*Procapra capensis*) I act with great diffidence, my reasons being similar to those given by Douthitt in his monograph on the Anoplocephalidæ, 1915 (4).

It was only by the application of the key to the subfamily Linstowinæ, given by Douthitt, that I was able to make any attempt to diagnose my material.

#### HYMENOLEPIDIDÆ Railliet & Henry, 1909.

DIPYLIDIINÆ Stiles, 1896.

CYCLORCHIDA Fuhrmann, 1907, e.p. emend.

*Generic diagnosis.* Dipylidiinæ. Rostellum armed with a double crown of hooks which have a very large dorsal root and a small hook portion.

Genital pores unilateral. Genital canals pass between the longitudinal excretory vessels. Cirrus pouch communicating with the genital cloaca by a narrow canal opening upon a large papilla. Testicles very numerous, entirely surrounding the female genital glands. Uterus ventral, growing laterally between the excretory vessels into the cortical parenchyma.

Adults in birds and mammals.

Type-species, *Cyclorchida omalancistrota* (Wedl, 1856), Fuhr., 1907.

CYCLORCHIDA CRASSIVESICULA, sp. n. (Text-figs. 11, 12.)

*Host.* *Paradoxurus hermaphroditus* (Pallas).

*Locality.* Malay States.

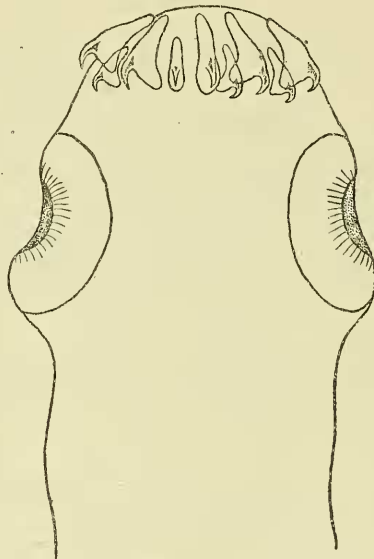
*Habitat.* Small intestine.

Length of strobila 16–20 cm. Maximum width 1–75 mm.

The head is  $250\ \mu$  long by  $280\ \mu$  broad. There are four suckers, each measuring  $100\ \mu$  in diameter. In front of the suckers there is a rostellum  $100\ \mu$  in length and  $200\ \mu$  broad at the base. The rostellum is armed with a double crown of ten large and ten small hooks which interdigitate one with the other.

The large hooks measure  $65\ \mu$  in length from the point of the

Text-figure 11.



*Cyclorchida crassivesicula*, sp. n. Scolex.

hook to the end of the haft, and  $27\ \mu$  from the point of the hook to the end of the guard.

The small hooks measure  $43\ \mu$  from the front of the hook to the end of the haft, and  $13\ \mu$  from the point of the hook to the end of the guard.

The hook portion is relatively very small compared with the basal portion formed by the haft and guard. The neck is  $500\ \mu$  long by  $180\ \mu$  broad. The first segments are equal in width to the neck, and are very short, gradually increasing in both dimensions to the posterior end of the strobila, where they measure  $\cdot 5$  mm. in length by  $1\cdot 75$  mm. in breadth.

In shape the segments are trapezoidal, broader than long, the

posterior border of each segment overlapping the anterior border of the following segment.

The genital pores are unilateral and protrude somewhat.

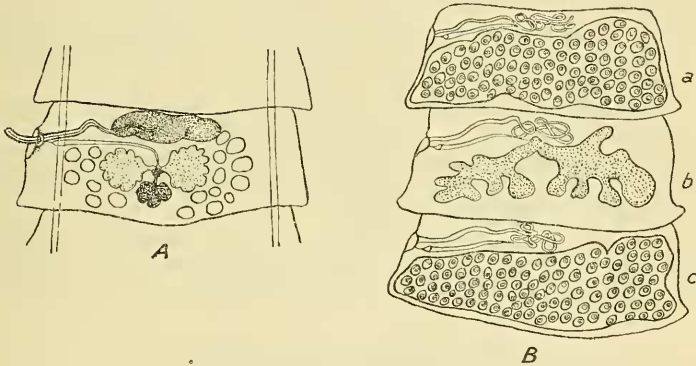
*Male reproductive organs.*

The testes are 16–20 in number, oval in shape, measuring 70–100  $\mu$  in their longest diameter.

In the younger segments they are arranged in a circle round the female genitalia. In the more mature segments they are pushed out laterally by the ovaries but still retain a suggestion of their circular arrangement. There is a large seminal vesicle which lies in the anterior third of the mature segments. In the ripe segments in which the male elements are spent, this vesicle resolves itself into a finely-coiled tube, which is continuous with the vas deferens.

The cirrus pouch is 150  $\mu$  long, and opens through a papilla into the genital atrium or cloaca.

Text-figure 12.



*Cycloorchida crassivesicula*, sp. n.

- A. Mature segment, showing male and female genitalia.  
 B. *a* and *c*. Ripe fertile segments.  
*b*. Unfertile segment showing shape of uterus.

In the mature segments the cirrus is extended; it measures 140  $\mu$  in length and 20  $\mu$  in breadth at the base, and is covered with small spines, which are directed backwards.

*Female reproductive organs.*

The two ovaries lie side by side in the centre of the segment; they are round lobulated organs measuring 160  $\mu$ –180  $\mu$  in diameter.

Between the ovaries a very minute shell-gland is situated. Immediately beneath the shell-gland lies a group of yolk-glands, which together form a lobulated kidney-shaped organ measuring

100  $\mu$  in length, having the hilum directed towards the shell-gland. The vagina, which arises from a point between the ovaries, is 165  $\mu$  in length.

As it approaches the genital opening it increases in width to a maximum of 20  $\mu$ , and at a point 30  $\mu$  from the genital aperture it narrows again to a fine duct, and opens into the genital atrium alongside the opening of the cirrus pouch.

The uterus lies horizontally in the segment, and in the unfertilised segment is a sac-like lobulated organ (text-fig. 12, b). In the ripe segment the uterus distends the whole segment and, pushes its way to the extreme edges on both sides. The eggs are single, oval in shape, and double-shelled.

The diameters of the outer shell are 140  $\mu \times 100 \mu$ : the embryophore is much smaller, measuring only 40  $\mu$  in diameter. No embryonal hooklets were seen.

In 1908 Smith, Fox, and White (5) described a cestode from *Paradoxurus grayi* which they named *Tenia paradoxuri*. From their description *T. paradoxuri* would seem to have no affinities with *C. crassivesicula*, the rostellum in the former species being unarmed and the genital pores irregularly alternating.

Up to the present the genus *Cyclorchida* is represented by the single species *C. omalancistrota* from the Spoonbill (*Platalea leucorodia*).

*Cyclorchida crassivesicula*, sp. n., agrees with the generic diagnosis of *Cyclorchida* as given by Ransom (1909) (6) in every respect except in the statement that the adults occur only in birds; I have therefore emended the generic diagnosis to read "*Adults in birds and mammals.*"

A comparison of the description of *C. omalancistrota*, as given by Lühe in 1909 (7), with my material offers no point of generic significance upon which to base a different genus.

#### TENIIDÆ Ludwig, 1886.

##### TENINÆ Stiles, 1896.

##### *Echinococcus granulosis* (Batsch, 1786), Rudolphi, 1805.

The diagnosis of this species, as given by Hall in 1919 (2), is of such latitude as to admit forms showing a variation of almost 100 per cent., and is evidently a careful compilation of the characters as described by various writers. Although there are many cases on record of larval forms which vary considerably from the typical Hydatid produced by the species *E. granulosis*, up to the present the occurrence of more than one species of adult does not seem to have been fully investigated.

Stiles in 1906 (8) suggested that an adult form from the Dingo might be a new species.

Lühe in 1910 (9) redescribed *Tenia oligartha* Diesing from *Felis concolor*, Brazil, and compared it with *Tenia echinococcus* V. Sieb. From his description it would appear to be a different



species, and therefore should be included in the genus *Echinococcus*. The specimens of adult *Echinococcus* collected from the small intestine of the Cape Hunting Dog (*Lycan capensis*) agree with the broad diagnosis as given by Hall except in regard to the eggs and the hooks. The eggs in my material measure  $50 \mu \times 40 \mu$ , whereas Hall gives  $36 \mu \times 30 \mu$  as the maximum. The shape of the hooks in my material differs considerably from the figures of Leuckart and Stiles, the notch between the handle and the guard being exceedingly deep.

I have diagnosed my specimens as *Echinococcus granulosus*, but I do so provisionally, feeling that further study and comparison with forms from other hosts may prove them to be another species.

Until a careful comparison is made of material from Australia, South America, Africa, and Europe it would be unwise to make any definite decision.

*List of Cestode Species arranged under Hosts.*

CARNIVORA.

VIVERRIDÆ.

VIVERRICULA MALACCENSIS. Indian Civet. India.

*Tenia teniceformis* (Batsch, 1786), Wolfhügel, 1911.

GENETTA GENETTA. Common Genet. Spain.

*Tenia teniceformis* (Batsch, 1786), Wolfhügel, 1911.

PARADOXURUS HERMAPHRODITUS. Malayan Paradoxure. Malay.

*Cyclorchida crassivesicula*, sp. n.

CANIDÆ.

VULPES VULPES. Common Fox. Britain.

*Mesocetoides lineatus* (Goeze, 1782), Railliet, 1893.

CANIS AUREUS. Common Jackal. India.

*Tenia balaniceps* Hall, 1910.

LYCAON CAPENSIS. Cape Hunting Dog. S. Africa.

*Echinococcus granulosus* (Batsch, 1786), Rudolphi, 1805.

MUSTELIDÆ.

MELES MELES. Common Badger. Britain.

*Mesocetoides lineatus* (Goeze, 1782), Railliet, 1893.

RODENTIA.

OCTODONTIDÆ.

MYOPOTAMUS COYPU. Coypu. S. America.

*Multiceps (Cœnurus) serialis* (Gervais, 1847), Stiles & Stev., 1905.

## HYRACES.

## PROCAVIIDÆ.

PROCAVIA CAPENSIS. Cape Hyrax. S. Africa.

*Inermicapsifer pagenstecheri* Janicki, 1910.

*Inermicapsifer settii* Janicki, 1910.

*Inermicapsifer interpositus* Janicki, 1910.

## UNGULATA.

## BOVIDÆ.

HIPPOTRAGUS EQUINUS. Roan Antelope. Africa.

*Cysticercus tenuicollis* Rudolphi, 1810.

*Moniezia expansa* (Rud., 1810), R. Blanchard, 1891.

AMMOTRAGUS LERVIA. Barbary Sheep. Morocco.

*Cysticercus tenuicollis* Rud., 1810.

OVIS VIGNEI. Urial Gad. India.

*Cysticercus tenuicollis* Rud., 1810.

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